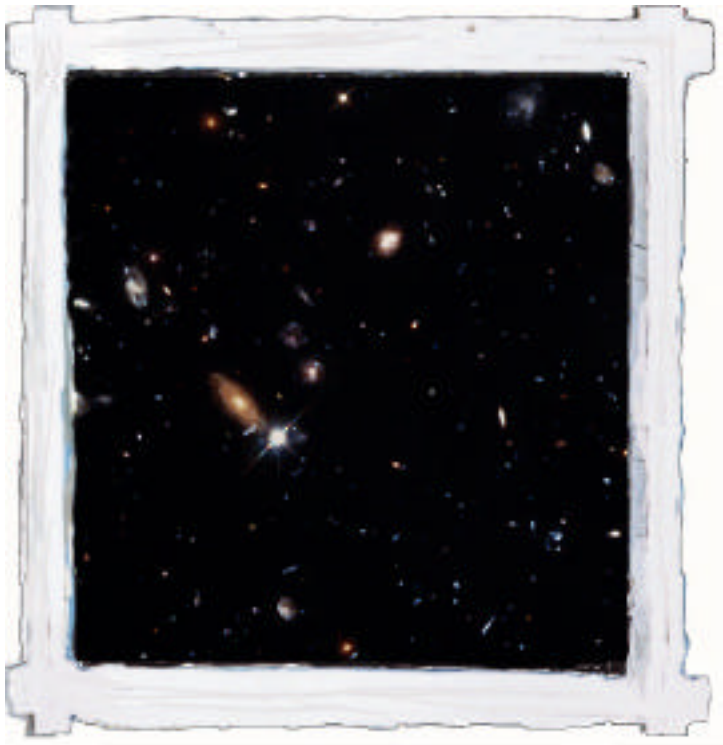
ORIGINS / NGST



THE NEXT GENERATION SPACE TELESCOPE

"Visiting a Time When Galaxies Were Young"
-from HST and Beyond, AURA

OTA Secondary Support Mast

Quarterly Review

Dave Jacobson, Larry Craig, Ed Ricks

October 9, 1997

MSFC

In an attempt to review and beef up the secondary support mast the team investigated several options:

- **Telescoping**
  - **Variety**

- **Folding**
  - **Single Fold**
  - **Multiple Fold**

Due to the configuration of the OTA in the stowed position and limited volume:

- **Folding can be complicated and introduces mechanical joint complications.**
  - **Primary issue is volume**

- **Alternative telescoping designs could work but present concept incorporates many value characteristics.**

  - **Baffle (particularly for stray light)**

  - **Fits Government OTA Concept**
    - **Volume**
    - **Storage**

Picture of stowed /deployed OTA

picture of OTA in Atlas

What are issues related to current concept

- **Structural frequency response in the 3-7 Hz range**

- **What benefit is the secondary baffle**

    - **Does baffle induce significant shadowing of the primary mirror**

- **What are the obscuration/diffraction patterns caused by the secondary mast.**

- **Only material utilized in analysis to date is Graphite Epoxy.**

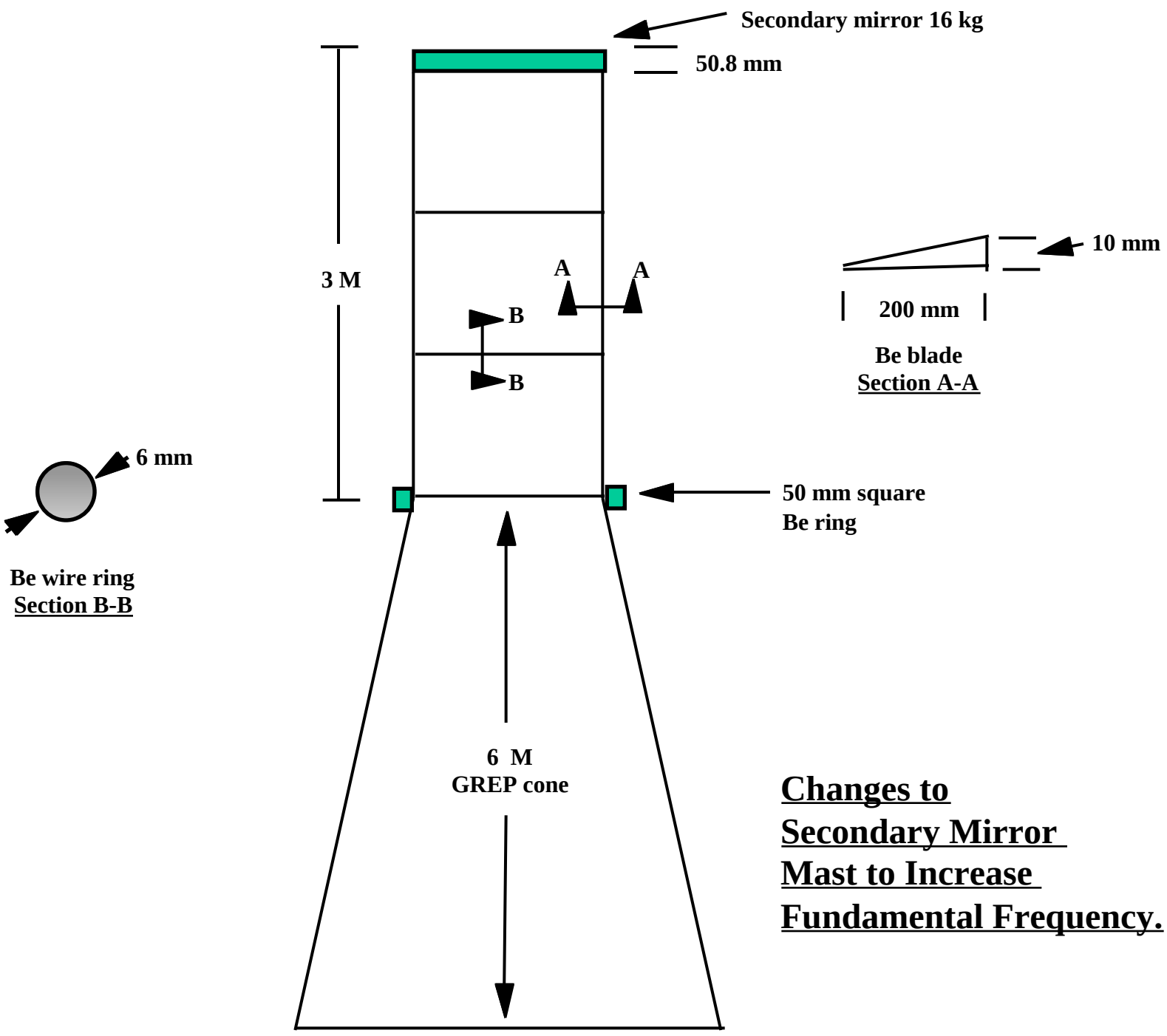
Frequency table of old OTA

Thermal diagram of OTA shadowing

Decided, first, to look into beefing up the current Secondary support mast:

- **Changed blade material to beryllium**
  - **Stiffer(higher E)**
- **Increased size of blades**
- **Incorporated Be ring at upper end of cone.**
- **Place small Be support wires laterally around blades at 1 meter intervals (2)**

Structural frequency response of bending in blades driven up to approximately 14 Hz.



Changes to Secondary Mirror Mast to Increase Fundamental Frequency.

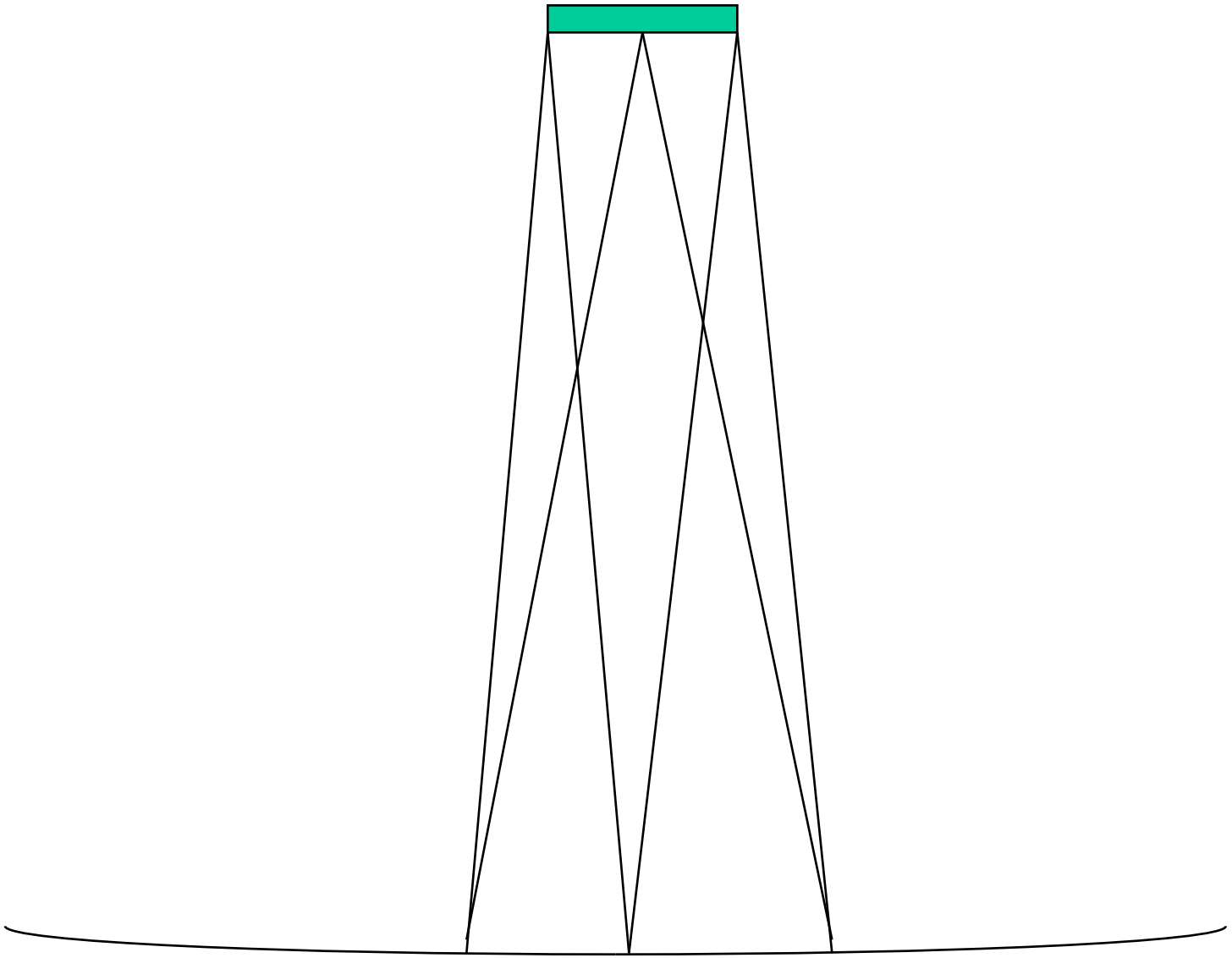
Obscuration/diffraction data original and modified OTA Secondary mast

new freq. table

Second, we took a look at a hexapod design for comparison

- **Assumed telescoping tubes**
  - **10 cm diameter**
  - **6 Tubes**
  - **Simple model for mode shapes**

Hexipod diagrams



hexipod frequency response table

Obscuration data

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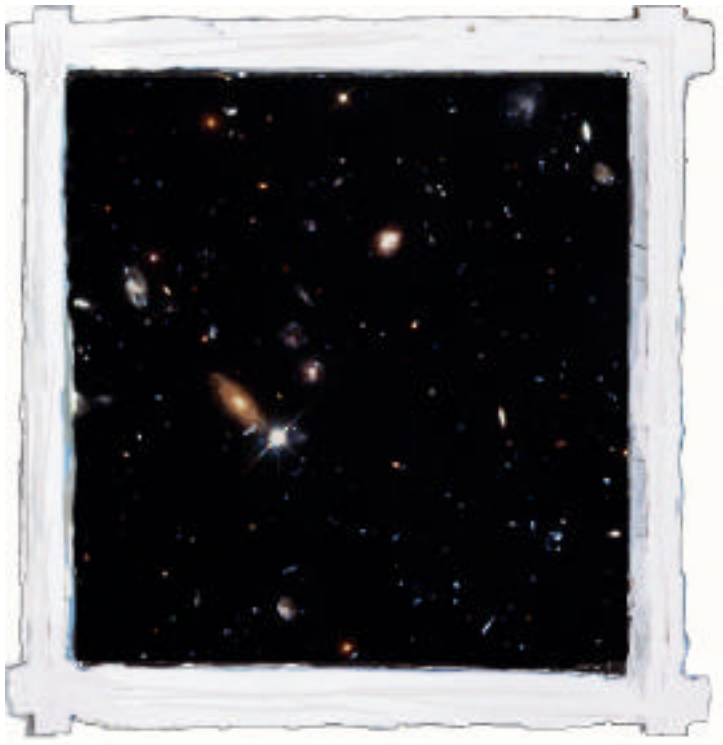

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THE NEXT GENERATION SPACE TELESCOPE

OTA Primary Mirror

Quarterly Review

Dave Jacobson, Larry Craig, Max Nein, Dick Cloyd

October 9, 1997

MSFC

- Activity Since Last Quarterly

  - Cleaned up beryllium design
    - Produced TM on Be results.
    - Produced Be on Be thermal results.

  - Began investigation of alternative glass design
    - 70 actuators/pedal with DM

    - Investigated minimum actuator density to support launch loads.

    - Began trade to investigate DM capability versus actuator density to correct for WFE.

    - Investigation of glass design initiated activity to investigate how the FEM handles these type elements.

      - Detailed analytical analysis kicked off to validate the FEM's way of dealing with thin shells(Toby Boulet-Utenn.)

- **Investigated UoA type glass design**

  - **Many actuators under thin facesheet**

    - **Larry Craig to present today**

  - **Investigated coatings/coating stresses for glass facesheet.**

    - **Coating stress due to deposition has shown negligible so far.**

    - **Coating stress due to Bimetallic deformation may be significant.**

    - **Have initiated activity with OCLI to support coating investigation.**

- Work in-progress
  - Investigating CTE variations across the Beryllium mirror
    - Delta temperature effects
    - Spacing variations
  - Complete remainder of thermal and structural results on current glass design.
  - Continuing to investigate coating stresses and ways to alleviate coating issues.
- Near term to do
  - Complete and sent out initial glass FEM and thermal analysis
  - Evaluate COI type design
  - Complete evaluation of alternate glass design
  - Generate tolerance budget for overall OTA
  - Continue other analytical investigations(FEM, stresses,etc.)

Next Generation Space Telescope (NGST) Quarterly Review

Structural Analysis

Oct 9, 1997

NGST Structural Analysis Quarterly Review

- Developed Optical Telescope Assembly (OTA) NASTRAN model with fused silica primary mirror
- Model has 3373 grid points and 5457 elements (QUAD4, TRIA3, BAR, RBE2)
- 1G gravity static (along optical axis) and modal analysis has been performed

NGST Structural Analysis Quarterly Review

- Performed design study to determine mods to existing secondary mirror mast to raise fundamental bending
- Developed hexapod secondary mirror support and performed modal analysis study

Remainder of Larry Craig Charts